Outline

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- Outline

        - Fundamentals for Future Systems Engineering
    - Systems Approach Applied to Engineered Systems
        - Overview of Systems Approaches
        - Engineered System Context
        - Identifying and Understanding Problems and Opportunities
        - Synthesizing Possible Solutions
        - Analysis and Selection between Alternative Solutions
        - Implementing and Proving a Solution
        - Deploying, Using, and Sustaining Systems to Solve Problems
        - Applying the Systems Approach
    - Systems Science
        - History of Systems Science
        - Cycles and the Cyclic Nature of Systems
        - Systems Approaches
    - Systems Thinking
        - What is Systems Thinking?
        - Concepts of Systems Thinking
        - Principles of Systems Thinking
        - Patterns of Systems Thinking
    - Representing Systems with Models
        - What is a Model?
        - Why Model?
        - Types of Models
        - System Modeling Concepts
        - Integrating Supporting Aspects into System Models
        - Modeling Standards
- Part 3: SE and Management
    - Introduction to Life Cycle Processes
        - Generic Life Cycle Model
        - Applying Life Cycle Processes
        - Life Cycle Processes and Enterprise Need
    - Life Cycle Models
        - Life Cycle Process Drivers and Choices
        - Life Cycle Process Models: Vee

    - Life Cycle Process Models: Iterative
    - Integration of Process
    - Lean Engineering
- Concept Definition
    - Business or Mission Analysis
    - Mission Engineering
    - Stakeholder Needs and Requirements
- System Definition
    - System Requirements
    - System Architecture
    - Logical Architecture Model Development
    - Physical Architecture Model Development
    - System Design
    - System Analysis
- System Realization
    - System Implementation
    - System Integration
    - System Verification
    - System Validation
- System Deployment and Use
    - System Deployment
    - Operation of the System
    - System Maintenance
    - Logistics
- Systems Engineering Management
    - Planning
    - Assessment and Control
    - Risk Management
    - Measurement
    - Decision Management
    - Configuration Management
    - Information Management
    - Quality Management
- Product and Service Life Management
    - Service Life Extension
    - Updates, Upgrades, and Modernization
    - Disposal and Retirement
- Systems Engineering Standards
    - Relevant Standards

        - Alignment and Comparison
        - Application
- Part 4: Applications of Systems Engineering
    - Product Systems Engineering
        - Product SE Background
        - Product as a System Fundamentals
        - Relate Business Activities
        - Product SE Key Aspects
        - Product SE Special Activities
    - Service Systems Engineering
        - Service Systems Background
        - Fundamentals of Services
        - Properties of Services
        - Scope of Service Systems Engineering
        - Value of Service Systems Engineering
        - Service Systems Engineering Stages
    - Enterprise Systems Engineering
        - Enterprise SE Background
        - The Enterprise as a System
        - Related Business Activities
        - Enterprise SE Key Concepts
        - Enterprise SE Process Activities
        - Enterprise Capability Management
    - Systems of Systems (SoS)
        - Architecting Approaches for SoS
        - Socio-Technical Features of SoS
        - Capability Engineering
    - Healthcare Systems Engineering
        - Overview of the Healthcare Sector
        - Systems Engineering in Healthcare Delivery
        - Systems Biology
        - Lean in Healthcare
- Part 5: Enabling Systems Engineering
    - Enabling Businesses and Enterprises
        - SE Organizational Strategy
        - Determining Needed Capabilities
        - Organizing Business to Perform SE
        - Assessing SE Performance
        - Developing SE Capabilities

        - Culture
    - Enabling Teams
        - Team Capability
        - Team Dynamics
        - Diversity, Equity, and Inclusion
        - Technical Leadership in SE
    - Enabling Individuals
        - Roles and Competencies
        - Assessing Individuals
        - Developing Individuals
        - Ethical Behavior
- Part 6: Related Disciplines
    - Systems Engineering and Environmental Engineering
    - Systems Engineering and Geospatial/Geodetic Engineering
        - Overview of Geospatial/Geodetic Engineering
        - Relationship between Systems Engineering and Geospatial/Geodetic Engineering
    - Systems Engineering and Industrial Engineering
    - Systems Engineering and Project Management
        - The Nature of Project Management
        - An Overview of the PMBOK® Guide
        - Relationships between Systems Engineering and Project Management
        - The Influence of Project Structure and Governance on Systems Engineering and Project Management Relationships
        - Procurement and Acquisition
        - Portfolio Management
    - Systems Engineering and Software Engineering
        - Software Engineering in the Systems Engineering Life Cycle
        - The Nature of Software
        - An Overview of the SWEBOK Guide
        - Key Points a Systems Engineer Needs to Know about Software Engineering
        - Software Engineering Features - Models, Methods, Tools, Standards, and Metrics

- Systems Engineering and Quality Attributes
  - Human Systems Integration
  - Manufacturability and Producibility
  - System Affordability
  - System Hardware Assurance
  - System Reliability, Availability, and Maintainability
  - System Resilience
  - System Resistance to Electromagnetic Interference
  - System Safety
  - System Security
- Part 7: SE Implementation Examples
  - Matrix of Implementation Examples
  - Implementation Examples
  - Defense System Examples
    - Submarine Warfare Federated Tactical Systems
    - Virginia Class Submarine
  - Information System Examples
    - Complex Adaptive Taxi Service Scheduler
    - Successful Business Transformation
    - FBI Virtual Case File System
  - Management System Examples
    - Project Management for a Complex Adaptive Operating System
  - Medical System Examples
    - Next Generation Medical Infusion Pump
    - Medical Radiation
    - Design for Maintainability
  - Space System Examples
    - Global Positioning System
    - Global Positioning System II
    - Russian Space Agency Project Management Systems
    - Cassini/Huygens
    - Hubble Space Telescope
    - Applying MB Approach for 30 Meter Telescope
    - MSTI Spacecraft

        - Apollo 1 Disaster
    - Transportation System Examples
        - Denver Baggage Handling
        - FAA Advanced Automation System
        - FAA NextGen
        - UK Route Modernisation
        - Korean Light Transit System
    - Utilities Examples
        - Northwest Hydro System
        - Singapore Water Management
- Part 8: Emerging Knowledge
    - Emerging Topics
        - Socio-technical Systems
        - Artificial Intelligence
        - Verification and Validation of Systems in Which AI is a Key Element
        - Transitioning Systems Engineering to a Model-based Discipline
        - Model-Based Systems Engineering Adoption Trends 2009-2018
        - Digital Engineering
        - Set-Based Design
    - Emerging Research
